

CDOT GUIDELINES ON
VARIABLE MESSAGE SIGNS (VMS)

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Colorado Department of Transportation

October, 2017

Contents

Overview	Page 3
Introduction	Page 3
Principles	Page 3
When to Use a VMS	Page 4
Incidents	Page 4
Traveler Information	Page 5
Public Service Announcements	Page 6
Blank Signs	Page 7
Message Content	Page 7
Timing	Page 7
Limit Panels	Page 8
Message Unit	Page 8
Message Length	Page 8
Message Familiarity	Page 8
Message Sets	Page 9
Advisory Signs	Page 9
Guide Signs	Page 9
Advance Signs	Page 10
The Portable VMS	Page 10
References	Page 11
Appendix A – Typical CDOT VMS Messages	Page 14-21
Appendix B – Common Abbreviations	Page 21-25
Appendix c – MUTCD	Page 23-32

OVERVIEW

The purpose of these guidelines is to ensure that Variable Message Sign (VMS) messages are used to inform and direct motorists of variable situations in a consistent and orderly manner. The messages are for the purpose of traffic control, management and timely traveler information.

INTRODUCTION

Variable Message Signs (VMS), also known as Dynamic Message Signs (DMS), Variable Message Boards (VMB), or Changeable Message Signs (CMS), are a valuable and effective traffic control tool available for construction, incident management, traveler information and maintenance activities today. In addition, they can be effective for large special events that significantly affect traffic flow. Care must be taken, however, that the VMS not be used for advertising. Used effectively, the VMS will provide changing – but specific information to the driver. For example:

A roadway problem	LEFT LANE CLOSED
The approximate location	1 MILE AHEAD
The instruction to the motorist	MERGE RIGHT

There are several possible roadway elements that a VMS can be utilized to notify the traveling public about. These include:

- Construction
- Incident Management
- Traveler Information
- Maintenance Activities
- Weather Alerts
- Specialty messages such as AMBER, Silver and Blue alerts

As with other traffic control devices, **credibility of the message is critical**. Without credibility, even the best message will go unheeded. Care must be taken not to display a message that motorists will disregard or will discover to be incorrect. Signs are a primary channel of communication to the motorist.

PRINCIPLES

This guideline sets forth the basic principles governing the use of VMS messages. As stated in the MUTCD, Section 1A.02, to be effective, the VMS message should meet the following requirements:

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Command respect of road users
- Give adequate time for proper response

Each VMS message shall be displayed for a specific purpose such as those provided in this guideline. VMS messages requested for roadway conditions or restrictions should be removed immediately when those conditions cease to exist or the restrictions are withdrawn. Identical conditions should always be given the same VMS message irrespective of where the conditions occur.

WHEN TO USE A VMS

It is CDOT policy that the Colorado Traffic Management Center (CTMC), Eisenhower Tunnel Traffic Management Center (EJMT-TMC) and Hanging Lakes Tunnel Traffic Management Center (HLT-TMC) shall have the authority to place messages on VMS in their respective areas of responsibility, as determined by Operations staff, or when message activation is requested from a verifiable and credible source (e.g., CDOT, Colorado State Patrol). Each TMC will be responsible for removal of said messages when applicable. The individual CDOT Regions, however, will have override authority for the VMS boards in their Region when requested through the respective TMC. Messages dealing with traveler safety and road conditions shall take precedence over informational messages.

As stated in the 2009 MUTCD, Section 2L.02: ***“Changeable message signs shall display only traffic, operational, regulatory, warning and guidance information. Advertising messages shall not be displayed on changeable message signs or its supports or other equipment.”***

With these facts in mind, the following are examples of when to use a VMS.

Incidents

1.) Accidents/Crashes

A crash located on a shoulder or with a minimum of blockage and short time duration may not require a VMS warning. In rural areas, the distance between the crash site and the closest VMS should also be considered.

Incidents that block lanes for substantial periods of time are ideal for getting information to the traveling public. Messages near the incident can inform motorists of the problem and move cars into open lanes. Signs farther away from the incident can suggest alternate routes.

2.) Traffic Diversion

Messages directing traffic to other routes, such as when a road or pass is closed due to weather.

3.) Incident Management Plan (IMP)

Use VMS signs per the traffic management strategies outlined in existing IMP. Regional, corridor-wide or project-wide incident management plans have been developed to facilitate response to incidents and help mitigate traffic congestion. VMS may be activated at the request of Corridor Managers, Incident managers or at the discretion of Operations staff as outlined in existing Incident Management Plans.

4.) Notice of Roadwork

This warns motorists of upcoming construction activities that will impact traffic flow. This may include lane closures, lane shifts, two-way traffic, shoulder work, and construction traffic entering the highway, detours, etc. This may supplement normal roadwork signing as required by the MUTCD.

5.) Regulatory

VMS are currently allowed by Colorado law to be used for regulatory purposes in two situations: during the use of High Occupancy Vehicle (HOV) lanes, and to inform drivers when chain/traction laws are in effect. VMS can be used to supplement regulatory signs.

6.) Adverse Weather and Roadway Conditions

Messages will be used to display current or expected adverse weather or roadway conditions that may impact the drivers' visibility or safety. These conditions may include snow, ice, fog, dust storms, falling rocks, high winds, storm warnings etc.

7.) Operation With Lane Control Signs (LUS)

Typically used in the tunnels and managed lanes, these signs have a red 'X' in the closed lane and a green arrow in the open lane and yellow chevrons to direct traffic.

Traveler Information

1.) Display of Future Roadwork

Motorists will be warned of road construction activities in the near future (within a week) that will adversely affect traffic. These messages will give the regular traveler a chance to change routes or travel times.

2.) Display Information for Other States

Adjacent states may have incidents or weather that forces the closure of a major highway. Messages on the same corridor or connecting corridor can inform interstate travelers of the incident, event or closure.
or to direct travel.

3.) Trip Travel Time

Trip Travel Time (TTT) Estimations have been established along several main corridors. TTT should be maintained whenever possible as a second panel of a message set and should be omitted or disabled if message content extends to 3 panels or if the roadway is closed.

4.) Special Events that Impact Traffic Flow

These messages display information about future events that are expected to impact traffic flow and/or roadway safety. Bicycle events, motorcycle events, Fairs, public gatherings are the most common. The messages should be displayed within a week of the event and should outline exact dates. Messaging must not be used to advertise for the event, but only to warn of traffic impacts or to direct travel.

5.) Chain Station Information

According to Colorado Revised Statute 42-4-106 VMS may be used to convey chain station information to commercial transportation. Information may include parking availability, station location or other pertinent safety information.

Public Service Announcements

1.) General Public Service Messages

Public service announcements (PSA) may be displayed on a limited, short-term basis, so that the primary purpose of the signs will not be degraded. PSA messages should be used sparingly in urban areas during peak traffic periods. PSA messages, such as notices for public meetings, job fairs and political information are not permitted by FHWA and the MUTCD. Care should be taken to avoid PSA messages running for long periods of time. When possible, messages should be rotated for campaigns lasting more than one week.

2.) Amber Alert/Silver Alert/Blue Alert/Hit and Run (Medina) Alerts

CDOT in partnership with the Colorado Bureau of Investigation (CBI) have established an AMBER Alert Policy in the event of child abduction. VMS procedure is detailed in that policy. CDOT will comply with VMS messaging as requested for other Alert types through CBI to the extent that viable and credible information is available. Message duration will be set at 3 hours unless directed otherwise from CBI.

3.) Fire Danger

Due to the nature of travel across Colorado, messages such as controlled burn, forest fire and fire ban information are considered appropriate messages. The U.S. Forest Service will notify CDOT in the event of a high or extreme fire danger or bans requiring public notice.

4.) Driver Safety Campaigns

Messages related to driver safety campaigns will be allowed and should follow the same guidelines as other PSA message types.

5.) CDOT Public Education

Messages informing travelers about information sources such as 511, COTrip.org and the availability of wireless alerts can be rotated in as with PSA messages. This includes programs such as trucker education similar to: “Truckers Winter is coming, Got Chains?” and “Trucks must carry chains west of Denver”.

6.) Web Addresses/URL information

VMS may be used to show “URL” info only when it is directed to a CDOT or Government site. Such sites should only be used for traveler information or other important data. Use of web addresses on VMS should be posted on a limited basis and shall not be used to advertise for projects or services. Addresses should be short and easily read at highway speeds and should refrain from using the HTTP:// and “WWW” prefixes. Messages falling outside these restrictions will require review by CDOT Public Information or the Chief Engineers office.

Blank Signs

A VMS will be in a blank mode when traffic, roadway, environmental, pavement conditions or public service announcements do not warrant the display of messages.

MESSAGE CONTENT

Variable Message Signs do provide a versatile means of communication. The message, however, must be concise and clear for the drivers to interpret at high speeds to reduce potential distractions. This section will illustrate how to write and display the message to give brief, clear and accurate information to the motorists.

Timing

The reading time is the time it actually takes a driver to read a sign message. The exposure time is the length of time a driver is within the legible distance of the message. So the exposure time must always be equal to or greater than the reading time. Depending upon the speed of the drivers, the message length must be adjusted to insure the reading time can fit into the exposure time.

The Traffic Control Devices Handbook by the Institute of Transportation Engineers states the MUTCD requires minimum legibility of variable message signs at 650 feet and 1,000 feet for higher speed facilities. The following shows how many seconds it takes to travel 1,000 feet at various speeds.

Speed	Time to Travel 1,000 feet (seconds)
45	15.2
55	12.3
65	10.5
75	9.1

When the VMS displays a series of message panels, 2-4 seconds per message panel is recommended. The blinking feature may be used on one or more of the panels. It should however not be used for more than one line of each panel.

The following table shows the maximum number of message panels that can be displayed for each speed limit, and provided there is at least 1,000 feet of site distance.

Speed Limit (MPH)	Number of Message Panels
65	2
75	2

If only one message panel is used, the sign may be at steady burn and the blinking feature may also be used for a single message (one message panel). For example, the single message panel may also be on for 2 seconds and off for 1 second.

Limit Panels

The limitations to the number of message panels to use is twofold:

1. Motorists should be able to read the message twice while traveling at the posted speed.
2. Try to keep the message to two panels, each panel should be a complete phrase and each phrase should be independent of the other. If the motorist begins reading the message at the 2nd panel, the total message should make sense.

Again, the average motorist, traveling at highway speeds, scan comprehend two message panels, and three lines of information for each panel. There will obviously be other times when exceptions must be made, but using less than three panels is a good rule of thumb.

As Per the 2009 MUTCD, section 2L-05. Each message shall consist of no more than two phases (panels). A phase (panel) shall consist of no more than three lines of text. Each phase (panel) shall be understood by itself regardless of the sequence in which it is read.

Message Unit

In each message there are units of information. A unit is one separate piece of data that the driver can recall and use to make a decision. A unit normally is one or two words but can be up to four words long. For example, the following message has four units of information:

What happened?	I-25 CLOSED
Where?	AT EXIT 287 WELLINGTON
Who is affected?	ALL TRAFFIC
What must they do?	MUST EXIT

Message Length

The message-load for the above is 4 units. That is reaching the limit for an average person to understand while traveling at a high speed. The message length is the number of words or characters in the message. The average motorist traveling at a high rate of speed can handle 8 word messages of 4 to 8 characters per word, (excluding prepositions). The number of panels or frames is another important variable in the construction of a clear message.

Message Familiarity

Message familiarity is another aide for motorist ability to understand a message. When information displayed to motorists is unusual, longer comprehension time is required. Common language is necessary. Appendix A contains a list of typical messages in many of the VMS memories. Appendix B contains a list of common abbreviations. Both attachments are valuable resources because this will help standardize messages and help motorists comprehend quickly.

To further message comprehension, the following are suggestions taken from research conducted in 2000 by the Texas Transportation Institute concerning messages drivers can comprehend quickly:

- Drivers have difficulty corresponding calendar days to days of the week. For example, “TUES – FRI” is preferred over “OCT 1 - OCT 4”.
- Drivers find the phrase “FOR 1 WEEK” ambiguous. It is preferable to use “WED–TUES”.
- Most drivers felt the term “WEEKEND” meant the work would begin Saturday morning and be complete by Sunday evening. It is recommended times and days be used if the work begins on Friday and extends to Monday.
- The highway or route numbers should be displayed with the route or interstate designation. The number alone can be confusing to both local and drivers from other areas.

Mile Markers shall only be used in reference to Chain Law locations, other messages shall have a common reference point such as 2 miles ahead, next 3 miles or a geographic location such as “Georgetown”

Generic messages such as “Winter Driving Conditions” should be avoided, specific descriptions (i.e. Heavy Snow, Icy conditions) are preferred.

Message Priority

Message content should fall under the following priority rules.

1. Safety Messages (Road Closed, Accident Ahead, Merge Right, etc...)
2. Regulatory (Chain Laws)
3. Amber Alert
4. Travel Times*/Chain Station location (Where applicable)
5. Public Service Messages. (Parking ahead, Click it or Ticket, etc...)

* Trip Travel Times should be maintained whenever possible unless a higher priority message supersedes. Trip Travel Times shall be omitted when message content goes to two panels.

Message Sets

There are three types of elements to use when messages fall under the categories of Incidents and Traveler Information:

Advisory Signs

The advisory signs display real-time information about freeway status and advisories concerning the best course of action. These will mostly be used for incidents. The advisory sign message should consist of the following:

- A problem statement (accident, road closure, construction, adverse weather, etc.)
- An effect statement (delay, congestion, etc.)
- An attention statement (addressing a certain group or audience)
- An action statement (what to do)

The minimum information is the problem and action statements. The location of the problem is also sometimes useful in a diversion decision.

HIGH WIND	< Problem Statement
RESTRICTION	< Effect Statement
HIGH PROFILE VEHICLES	< Attention Statement
MAY BE STOPPED	< Action Statement

Advance Signs

There are times to inform drivers of incidents that are farther ahead of the current location. This up-to-date information has the following basic elements that can be communicated:

- Information alert
- Nature of information (best route, traffic conditions, etc.)
- Destination for which information applies
- Location of the information (AHEAD or specific distance)

If there is a diversion situation with known alternative routes available:

- Route markers of the major alternative routes.

PORTABLE VMS

The above guidelines apply to all types of VMS, but because of its nature, the following additional guidelines are applicable to the portable VMS.

The proper placement of a portable VMS is critical to its effectiveness. The placement requirement must give the motorist adequate time to react to the message. The VMS must be located prior to major decision points, such as intersections or interchanges, where the driver may change their travel plans. (On the Interstate, or other access-controlled freeways, placement 1 mile prior to the interchange is recommended.) Also, it must be placed prior to the present and expected traffic backups.

Placement requirements include:

- To provide 800 feet of sight distance.
- Where signs, poles, or other objects will not obstruct the VMS.
- On a level surface.
- Not within an intersection or interchange.
- Should not interfere with other traffic control devices.

If more than 2 VMS are to be used in sequence, they should be separated by at least 1,000 feet.

The sign should be placed off of the shoulder of the roadway, behind the guardrail, if possible, and where it will be accessible to maintenance vehicles even if the traffic queue develops or grows. To be comfortable to read, the VMS panel should be turned slightly towards the driver's view, at approximately 5 to 10 degrees from perpendicular of the road's centerline. Reading the VMS becomes more difficult as the angle is increased from the normal field of vision. It is recommended to drive by the VMS after installation to be sure the sign is readable from the road.

If the portable VMS is set up along the roadway and a message will not yet be needed for a period of 4 hours or more, the sign panel should be turned away from traffic, parallel to the road's centerline. No blank signs should be facing the drivers for extended periods.

References:

-Manual on Uniform Traffic Control Devices (MUTCD), for Streets and Highways, 2009 Edition

-Traffic Control Devices Handbook, 2001, Institute of Transportation Engineers

-Dudek, C.L., N. Trout, S. Booth, and G. Ullman, *Improved Dynamic Message Sign Messages and Operations*, FHWA/TX-01/1882-2, Texas Transportation Institute, The Texas A&M University System, College Station, Texas, 77843-3135, October 2000.

Appendix A

Typical CDOT VMS Messages

AVALANCHE CONTROL

AVALANCHE CONTROL EXPECT DELAY

CHAINS

SINGLE AXLE CMV MUST CHAIN MM XXX

CHAINS

SINGLE AXLE CMV MUST CHAIN MM XXX USE CHAIN STATION X MILES AHEAD

CHAINS

ALL CMV MUST CHAIN MM XXX

CHAINS

ALL CMV MUST CHAIN MM XXX USE CHAIN STATION X MILES AHEAD

CHAINS

1 DRIVE AXLE CMV MUST CHAIN (SMALL SIGNS ONLY)

CHAINS

ALL VEHICLES CHAINS REQUIRED

CHAINS

ALL VEHICLES MUST USE CHAINS OR SNOWTIRES

CHAINS

CHAIN UP STATION MM ____

CHAINS

ALL CMV CHAINS REQUIRED

CHAINS

TRACTION LAW (location) TO (location)

CHAINS

TRACTION LAW TO (location)

CHAINS

TRACTION LAW IN EFFECT ALL VEHICLES MUST USE CHAINS OR SNOWTIRES

CLOSURE

ACCIDENT AHEAD ROAD CLOSED

CLOSURE

CENTER LANE CLOSED AHEAD

CLOSURE

EXIT CLOSED AHEAD

CLOSURE

FRONTAGE ROAD CLOSED

CLOSURE

I-25 AND US 287 CLOSED TO WYOMING

CLOSURE

I-25 CLOSED AT EXIT 287 WELLINGTON ALL TRAFFIC MUST EXIT

CLOSURE

I-25 OVERNIGHT CLOSURE: ____ TO ____ (11PM-5:30AM)

CLOSURE

I-76 CLOSED AT NEB BORDER

CLOSURE

I-25 CLOSED TO CHEYENNE, WY

CLOSURE

LEFT LANE CLOSED

CLOSURE

LEFT LANE CLOSED AHEAD

CLOSURE

LEFT SHOULDER CLOSED AHEAD

CLOSURE

RAMP CLOSED

CLOSURE

RAMP CLOSED AHEAD

CLOSURE

REST AREA CLOSED

CLOSURE
RIGHT LANE CLOSED

CLOSURE
RIGHT LANE CLOSED AHEAD

CLOSURE
RIGHT SHOULDER CLOSED AHEAD

CLOSURE
ROAD CLOSED

CLOSURE
ROAD CLOSED ____ MILES AHEAD

CLOSURE
ROAD CLOSED AHEAD

CLOSURE
ROAD TEMPORARILY CLOSED

CLOSURE
TUNNEL CLOSED AHEAD

CLOSURE
US 287 CLOSED INTO WYOMING

CONSTRUCTION
BRIDGE WORK AHEAD

CONSTRUCTION
CONSTRUCTION AHEAD EXPECT DELAYS

CONSTRUCTION
CONSTRUCTION NEXT ____ MILES

CONSTRUCTION
CRACK FILLING AHEAD

CONSTRUCTION
FLAGGER AHEAD

CONSTRUCTION
FRESH TAR ON ROAD

CONSTRUCTION
MEDIAN WORK AHEAD

CONSTRUCTION
METAL PLATES AHEAD

CONSTRUCTION
MOBILE PATCHING AHEAD

CONSTRUCTION
MOWERS AHEAD

CONSTRUCTION
MOWERS NEXT ____ MILES

CONSTRUCTION
NIGHT WORK AHEAD

CONSTRUCTION
PAINT CREW AHEAD

CONSTRUCTION
PAVING OPERATIONS AHEAD

CONSTRUCTION
ROAD PAVING AHEAD

CONSTRUCTION
ROAD WORK AHEAD EXPECT DELAYS

CONSTRUCTION
ROAD WORK NEXT ____ MILES

CONSTRUCTION
ROAD WORKERS AHEAD

CONSTRUCTION
SHOULDER WORK AHEAD

CONSTRUCTION
SLOW MOVING VEHICLE

CONSTRUCTION
SNOW BLOWERS AHEAD

CONSTRUCTION
SNOW REMOVAL AHEAD

CONSTRUCTION
SURVEY CREW AHEAD

CONSTRUCTION
SWEEPING AHEAD

CONSTRUCTION
TRUCKS CROSSING

CONSTRUCTION
WATCH FOR TRUCKS

CONSTRUCTION
WET PAINT

CONSTRUCTION
WORKERS IN TUNNEL

DIRECTIONAL
CRASH AHEAD ALL TRAFFIC MUST EXIT

DIRECTIONAL
CRASH AHEAD BE PREPARED TO STOP

DIRECTIONAL
CRASH AHEAD EXPECT DELAYS

DIRECTIONAL
CRASH AHEAD MERGE LEFT

DIRECTIONAL
CRASH AHEAD MERGE RIGHT

DIRECTIONAL
ALL RAMPS OPEN

DIRECTIONAL
ALL TRAFFIC EXIT

DIRECTIONAL
ALL TRAFFIC EXIT LEFT

DIRECTIONAL
ALL TRAFFIC EXIT RIGHT

DIRECTIONAL
ALL TRAFFIC MUST STOP

DIRECTIONAL
BUMP AHEAD

DIRECTIONAL
CHECK FUEL BEFORE ENTERING

DIRECTIONAL
CONGESTED AREA AHEAD

DIRECTIONAL
CURVE AHEAD

DIRECTIONAL
DETOUR

DIRECTIONAL
DIP AHEAD

DIRECTIONAL
DO NOT PASS

DIRECTIONAL
EXIT HERE

DIRECTIONAL
EXPECT DELAY

DIRECTIONAL
FORM ONE LINE LEFT

DIRECTIONAL
FORM ONE LINE RIGHT

DIRECTIONAL
FORM TWO LANES LEFT

DIRECTIONAL
FORM TWO LANES RIGHT

DIRECTIONAL
HEAVY TRAFFIC AHEAD

DIRECTIONAL
HEAVY TRAFFIC TO DENVER

DIRECTIONAL
HEAVY TRAFFIC TO MOUNTAINS

DIRECTIONAL
KEEP LEFT

DIRECTIONAL
KEEP RIGHT

DIRECTIONAL
LANE CLOSURES AHEAD EXPECT DELAYS

DIRECTIONAL
LANE CONTROL AHEAD

DIRECTIONAL
LANE ENDS

DIRECTIONAL
LANE NARROWS AHEAD

DIRECTIONAL
LANES MERGE AHEAD

DIRECTIONAL
LEFT 2 LANES CLOSED

DIRECTIONAL
LIMITED SIGHT DISTANCE

DIRECTIONAL
LOOSE GRAVEL AHEAD

DIRECTIONAL
LOOSE GRAVEL ON ROAD

DIRECTIONAL
MAX SPEED ____ MPH

DIRECTIONAL
MERGE AHEAD

DIRECTIONAL
MERGE LEFT

DIRECTIONAL
MERGE RIGHT

DIRECTIONAL
MERGE RIGHT

DIRECTIONAL
MERGE RIGHT

DIRECTIONAL
MERGE RIGHT

DIRECTIONAL
MERGING TRAFFIC AHEAD

DIRECTIONAL
MINIMUM SPEED ____ MPH

DIRECTIONAL
NO PASSING

DIRECTIONAL
NO PASSING

DIRECTIONAL
NO SHOULDER

DIRECTIONAL
NO WIDE LOADS

DIRECTIONAL
ONE LANE BRIDGE AHEAD

DIRECTIONAL
ONE LANE TRAFFIC

DIRECTIONAL
PASS LEFT

DIRECTIONAL
PASS RIGHT

DIRECTIONAL
PAVEMENT ENDS

DIRECTIONAL
PEDESTRIAN CROSSING

DIRECTIONAL
PILOT CAR AHEAD

DIRECTIONAL
PREPARE TO MERGE

DIRECTIONAL
RIGHT LEFT 2 LANES CLOSED

DIRECTIONAL
ROAD NARROWS AHEAD

DIRECTIONAL
ROCKS ON ROAD

DIRECTIONAL
ROUGH ROAD AHEAD

DIRECTIONAL
SHARP CURVE AHEAD

DIRECTIONAL
SHOULDER DROP OFF

DIRECTIONAL
SHOULDER DROP OFF AHEAD

DIRECTIONAL
SIGNAL AHEAD

DIRECTIONAL
SIGNAL NOT WORKING

DIRECTIONAL
SINGLE LANE AHEAD

DIRECTIONAL
SLOW TRAFFIC

DIRECTIONAL
SOFT SHOULDER AHEAD

DIRECTIONAL
SPEED LIMIT STRICTLY ENFORCED

DIRECTIONAL
STAY IN LANE

DIRECTIONAL
STAY IN LANE

DIRECTIONAL
STEEP GRADE

DIRECTIONAL
STOP AHEAD

DIRECTIONAL
TWO LANE TRAFFIC AHEAD

DIRECTIONAL
TWO-WAY TRAFFIC

DIRECTIONAL
TWO-WAY TRAFFIC AHEAD

DIRECTIONAL
UNEVEN PAVEMENT AHEAD

DIRECTIONAL
UNMARKED LANES AHEAD

DIRECTIONAL
USE DETOUR

DIRECTIONAL
USE DETOUR ROUTE

DIRECTIONAL
USE LEFT LANE

DIRECTIONAL
USE RIGHT LANE

DIRECTIONAL
VEHICLES CROSSING

DIRECTIONAL
WATCH FOR ROCKS ON ROAD

DIRECTIONAL
WATCH FOR ROCKS ON ROAD

DIRECTIONAL
WATCH FOR STOPPED TRAFFIC

DIRECTIONAL
YIELD

DIRECTIONAL
YIELD AHEAD

FIRE
CONTROLLED BURN IN AREA SMOKE MAY BE VISIBLE

FIRE
EXTREME FIRE DANGER LOCAL BANS IN EFFECT

FIRE
EXTREME FIRE DANGER NO OPEN BURNING NO FIREWORKS

FIRE
HIGH FIRE DANGER LOCAL BANS IN EFFECT

INFO
TRAVEL INFORMATION COTRIP.ORG

INFO
WIRELESS TRAVEL ALERTS COTRIP.ORG

FIRE
TRAVEL TIME INFO COTRIP.ORG

INFO
KNOW BEFORE YOU GO COTRIP.ORG

INFO
COLORADO ROAD INFO COTRIP.ORG/CALL 511

INFO
TRUCKER INFORMATION COTRIP.ORG/CALL 511

INFO
TRUCKS MUST CARRY CHAINS WEST OF DENVER MM 259- MM 133

INFO
TRUCKS MUST CARRY CHAINS I-70 MM 259- MM 133

INFO
TRUCKS MUST CARRY CHAINS I-70 MM 259-133 SEPT 1-MAY 31

INFO
TRUCKERS: WINTER IS COMING GOT CHAINS?

INFO
STATE LAW: KEEP RIGHT EXCEPT TO PASS

INFO
STATE LAW: MOVE ACCIDENTS FROM TRAFFIC

FIRE
STATE LAW: MOVE OVER FOR STOPPED EMERGENCY VEHICLES

INFO
ROAD AND WEATHER INFO CALL 511

TRUCKS
BRIDGE WEIGHT LIMIT AHEAD

TRUCKS
LOW BRIDGE AHEAD

TRUCKS
LOWER/UPPER RUNAWAY TRUCK RAMP OCCUPIED

TRUCKS
RUNAWAY TRUCK RAMP

TRUCKS
RUNAWAY TRUCK RAMP CLOSED

TRUCKS
RUNAWAY TRUCK RAMP OCCUPIED

TRUCKS
TRUCKS USE LEFT LANE

TRUCKS
TRUCKS USE LOW GEAR

TRUCKS
TRUCKS USE RIGHT LANE

TRUCKS
LANES SHIFT AHEAD

WEATHER
BLOWING SNOW AHEAD

WEATHER
BRIDGES MAY BE ICY

WEATHER
DENSE FOG AHEAD

WEATHER
DRIFTING SNOW ON ROAD

WEATHER
FLOODED ROAD AHEAD

WEATHER
FOG AND ICY CONDITIONS MAY EXIST

WEATHER
FOGGY CONDITIONS MAY EXIST

WEATHER
GUSTY WINDS AHEAD

WEATHER
POOR VISIBILITY FOG/SNOW/DUST AHEAD

WEATHER
HEAVY SNOW AND SPLASHBACK

WEATHER
HIGH WIND ADVISORY HIGH PROFILE VEHICLES USE CAUTION

WEATHER
HIGH WIND RESTRICTION HIGH PROFILE VEHICLES MAY BE STOPPED

WEATHER
ICY CONDITIONS MAY EXIST

WEATHER
POOR VISIBILITY AHEAD

WEATHER
REDUCED VISIBILITY AHEAD

WEATHER
REDUCED VISIBILITY BLOWING SNOW

WEATHER
ROAD ICY AND SNOWPACKED

WEATHER
ROAD ICY IN SPOTS

WEATHER
ROAD MAY BE ICY IN SPOTS

WEATHER
ROAD SNOWPACKED

WEATHER
ROAD SNOWPACKED AND ICY IN SPOTS

WEATHER
ROAD SNOWPACKED IN SPOTS

WEATHER
SNOWSLIDE AHEAD

WEATHER
WATER ON ROAD

WEATHER
ICY ROADS X MILES AHEAD

WEATHER
ICY SNOW PACKED ROADS NEXT X MILES

WEATHER
WINTER WEATHER WARNING/ADVISORY NEXT X HOURS

WEATHER
WINTER WEATHER WARNING/ADVISORY TONIGHT/TOMORROW

WEATHER
WINTER WEATHER WARNING/ADVISORY THROUGH (day)

WEATHER
TRACTION LAWS LIKELY

WEATHER
TRACTION/CHAIN LAWS LIKELY

WEATHER
ROADS MAY REFREEZE OVERNIGHT

WEATHER
BRIDGES FREEZE BEFORE ROAD

WEATHER
RAMPS MAY BE ICY

PROGRAMS

THE HEAT IS ON DON'T DRINK AND DRIVE

PROGRAMS

OVER THE LIMIT UNDER ARREST

PROGRAMS

THE HEAT IS ON HOLIDAY DUI PATROLS

PROGRAMS

CLICK IT OR TICKET PLEASE BUCKLE UP

PROGRAMS

SEATBELTS SAVE LIVES CLICK IT OR TICKET

SPECIAL EVENTS

THE HEAT IS ON DON'T DRINK AND DRIVE

SPECIAL EVENTS

STOCK SHOW PARKING EXIT XXX

SPECIAL EVENTS

STATE FAIR PARKING EXIT XXX

SPECIAL EVENTS

STATE FAIR SHUTTLE EXIT XXX

SPECIAL EVENTS

EVENT PARKING EXIT XXX

SPECIAL EVENTS

EVENT SHUTTLE EXIT XXX

SPECIAL EVENTS

PARADE PARKING EXIT XXX

SPECIAL EVENTS

BICYCLE RACE (DATE) INFO COTRIP.ORG

SPECIAL EVENTS

BICYCLE RACE (DATE) INFO CALL 511

COMMON ABBREVIATIONS

Abbreviations well understood by drivers	Words and word combinations well understood with a prompt word (prompt word examples in parentheses)	Abbreviations with multiple interpretations (shown in parentheses) or completely misunderstood
BLVD CNTR CONST EMER ENT EX EXPWY FRWY, FWY HWY INFO LFT MAINT NORM PKING RD SERV SHLDR SLIP SPD TRAF TRVLRS WARN	(FOG, ACCIDENT) AHD ACCDT AT (LANE) BLKD ACCS (ROAD) ACCES RD (Bridge Name) BRDG CHEM (SPILL) COM (VEHICLES) CONST (AHEAD) (TO) DWNTN (NEXT) EX, EXT EXP (LANE) FWY BLKD HAZ (DRIVING) 1(25) US - (85) LFT LN LN CLSD MM (281) MAJ (ACCIDENT, ACCDT) MNR (ACCIDENT, ACCDT) (20) MI (20) MIN OVSZ (LOAD) PREP (TO STOP) (WET) PVMT (AIR) QLT RD WK RGT LN (BEST) RT (ON) SHLDR (E-470) TRNPK (STALLED, EMER) VEH E, W, N, S (street name) UPR, LWR (LEVEL, LVL) WT (LIMIT)	ALT RT ACC (accident, access) DLY (delay, daily) EB, WB, NB, SB FEED RD FRNTG RD INCDT, INCID INTCH MAJ CONG LT (left, light) STAD (stadium, standard) L (left, lane) PARK (parking, park) RED (red, reduce) POLL (pollution, poll) FDR (feeder, federal) LOC (local, location) TEMP (temporary, temperature) CLRS (clears, colors) WRNG (warning, wrong) VIC

Appendix C/ MUTCD 2009

Section 1A.15 Abbreviations Used on Traffic Control Devices

Standard:

01 When the word messages shown in Table 1A-1 need to be abbreviated in connection with traffic control devices, the abbreviations shown in Table 1A-1 shall be used.

02 When the word messages shown in Table 1A-2 need to be abbreviated on a portable changeable message sign, the abbreviations shown in Table 1A-2 shall be used. Unless indicated by an asterisk, these abbreviations shall only be used on portable changeable message signs.

Guidance:

03 The abbreviations for the words listed in Table 1A-2 that also show a prompt word should not be used on a portable changeable message sign unless the prompt word shown in Table 1A-2 either precedes or follows the abbreviation, as applicable.

Standard:

04 The abbreviations shown in Table 1A-3 shall not be used in connection with traffic control devices because of their potential to be misinterpreted by road users.

Guidance:

05 If multiple abbreviations are permitted in Table 1A-1 or 1A-2, the same abbreviation should be used throughout a single jurisdiction.

06 Except as otherwise provided in Table 1A-1 or 1A-2 or unless necessary to avoid confusion, periods, commas, apostrophes, question marks, ampersands, and other punctuation marks or characters that are not letters or numerals should not be used in any abbreviation.

Table 1A-1. Acceptable Abbreviations

Word Message	Standard Abbreviation
Afternoon / Evening	PM
Alternate	ALT
AM Radio	AM
Avenue	AVE, AV
Bicycle	BIKE
Boulevard	BLVD*
Bridge	(See Table 1A-2)
CB Radio	CB
Center (as part of a place name)	CTR
Circle	CIR*
Civil Defense	CD
Compressed Natural Gas	CNG
Court	CT*
Crossing (other than highway-rail)	X-ING
Drive	DR*
East	E
Electric Vehicle	EV
Expressway	EXPWY*
Feet	FT
FM Radio	FM
Freeway	FRWY, FWY*
Friday	FRI
Hazardous Material	HAZMAT
High Occupancy Vehicle	HOV

Word Message	Standard Abbreviation
Highway	HWY*
Hospital	HOSP
Hour(s)	HR, HRS
Information	INFO
Inherently Low Emission Vehicle	ILEV
International	INTL
Interstate	(See Table 1A-2)
Junction / Intersection	JCT
Lane	(See Table 1A-2)
Liquid Propane Gas	LP-GAS
Maximum	MAX
Mile(s)	MI
Miles Per Hour	MPH
Minimum	MIN
Minute(s)	MIN
Monday	MON
Morning / Late Night	AM
Mount	MT
Mountain	MTN
National	NATL
North	N
Parkway	PKWY*
Pedestrian	PED
Place	PL*

Word Message	Standard Abbreviation
Pounds	LBS
Road	RD*
Saint	ST
Saturday	SAT
South	S
State, county, or other non-US or non-Interstate numbered route	(See Table 1A-2)
Street	ST*
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Terrace	TER*
Thursday	THURS
Thruway	THWY*
Tons of Weight	T
Trail	TR*
Tuesday	TUES
Turnpike	TPK*
Two-Way Intersection	2-WAY
US Numbered Route	US
Wednesday	WED
West	W

*This abbreviation shall not be used for any application other than the name of a roadway.

**Table 1A-2. Abbreviations That Shall be Used Only
on Portable Changeable Message Signs**

Word Message	Standard Abbreviation	Prompt Word That Should Precede the Abbreviation	Prompt Word That Should Follow the Abbreviation
Access	ACCS	—	Road
Ahead	AHD	Fog	—
Blocked	BLKD	Lane	—
Bridge	BR*	[Name]	—
Cannot	CANT	—	—
Center	CNTR	—	Lane
Chemical	CHEM	—	Spill
Condition	COND	Traffic	—
Congested	CONG	Traffic	—
Construction	CONST	—	Ahead
Crossing	XING	—	—
Do Not	DONT	—	—
Downtown	DWNTN	—	Traffic
Eastbound	E-BND	—	—
Emergency	EMER	—	—
Entrance, Enter	ENT	—	—
Exit	EX	Next	—
Express	EXP	—	Lane
Frontage	FRNTG	—	Road
Hazardous	HAZ	—	Driving
Highway-Rail Grade Crossing	RR XING	—	—
Interstate	I-*	—	[Number]
It Is	ITS	—	—
Lane	LN	[Roadway Name]*, Right, Left, Center	—
Left	LFT	—	—
Local	LOC	—	Traffic
Lower	LWR	—	Level
Maintenance	MAINT	—	—
Major	MAJ	—	Accident
Minor	MNR	—	Accident
Normal	NORM	—	—
Northbound	N-BND	—	—
Oversized	OVRSZ	—	Load
Parking	PKING	—	—
Pavement	PVMT	Wet	—
Prepare	PREP	—	To Stop
Quality	QLTY	Air	—
Right	RT	Keep, Next	—
Right	RT	—	Lane
Roadwork	RDWK	—	Ahead, [Distance]
Route	RT, RTE	Best	—
Service	SERV	—	—
Shoulder	SHLDR	—	—
Slippery	SLIP	—	—
Southbound	S-BND	—	—
Speed	SPD	—	—
State, county, or other non-US or non-Interstate numbered route	[Route Abbreviation determined by highway agency]**	—	[Number]
Tires With Lugs	LUGS	—	—
Traffic	TRAF	—	—
Travelers	TRVLRS	—	—
Two-Wheeled Vehicles	CYCLES	—	—
Upper	UPR	—	Level
Vehicle(s)	VEH, VEHS	—	—
Warning	WARN	—	—
Westbound	W-BND	—	—
Will Not	WONT	—	—

* This abbreviation, when accompanied by the prompt word, may be used on traffic control devices other than portable changeable message signs.

** A space and no dash shall be placed between the abbreviation and the number of the route.

Table 1A-3. Unacceptable Abbreviations

Abbreviation	Intended Word	Common Misinterpretation
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong

CHAPTER 2L. CHANGEABLE MESSAGE SIGNS

Section 2L.01 Description of Changeable Message Signs

Support:

01 A changeable message sign (CMS) is a traffic control device that is capable of displaying one or more alternative messages. Some changeable message signs have a blank mode when no message is displayed, while others display multiple messages with only one of the messages displayed at a time (such as OPEN/CLOSED signs at weigh stations).

02 The provisions in this Chapter apply to both permanent and portable changeable message signs with electronic displays. Additional provisions that only apply to portable changeable message signs can be found in Section 6F.60. The provisions in this Chapter do not apply to changeable message signs with non-electronic displays that are changed either manually or electromechanically, such as a hinged-panel, rotating-drum, or back-lit curtain or scroll CMS.

Standard:

03 **Except as provided in Paragraph 2 of Section 2L.02, changeable message signs shall display only traffic operational, regulatory, warning, and guidance information. Advertising messages shall not be displayed on changeable message signs or its supports or other equipment.**

04 **The design of legends for non-electronic display changeable message signs shall comply with the provisions of Chapters 2A through 2K, 2M, and 2N of this Manual. All other changeable message signs shall comply with the design and application principles established in this Chapter and in Chapter 2A.**

Guidance:

05 *Blank-out signs that display only single-phase, predetermined electronic-display legends that are limited by their composition and arrangement of pixels or other illuminated forms in a fixed arrangement (such as a blank-out sign indicating a part-time turn prohibition, a blank-out or changeable lane-use sign, or a changeable OPEN/CLOSED sign for a weigh station) should comply with the provisions of the applicable Section for the specific type of sign, provided that the letter forms, symbols, and other legend elements are duplicates of the static messages as detailed in the "Standard Highway Signs and Markings" book (see Section 1A.11). Because such a sign is effectively an illuminated version of a static sign, the size of its legend elements, the overall size of the sign, and placement of the sign should comply with the applicable provisions for the static version of the sign.*

Section 2L.02 Applications of Changeable Message Signs

Support:

- 01 Changeable message signs have a large number of applications including, but not limited to, the following:
- A. Incident management and route diversion
 - B. Warning of adverse weather conditions
 - C. Special event applications associated with traffic control or conditions
 - D. Control at crossing situations
 - E. Lane, ramp, and roadway control
 - F. Priced or other types of managed lanes
 - G. Travel times
 - H. Warning situations
 - I. Traffic regulations
 - J. Speed control
 - K. Destination guidance

Option:

02 Changeable message signs may be used by State and local highway agencies to display safety messages, transportation-related messages, emergency homeland security messages, and America's Missing: Broadcast Emergency Response (AMBER) alert messages.

Guidance:

03 *State and local highway agencies should develop and establish a policy regarding the display of the types of messages provided in Paragraph 2. When changeable message signs are used at multiple locations to address a specific situation, the message displays should be consistent along the roadway corridor and adjacent corridors, which might necessitate coordination among different operating agencies.*

Support:

04 Examples of safety messages include "SEAT BELT BUCKLED?" and "DON'T DRINK AND DRIVE." Examples of transportation-related messages include "STADIUM EVENT SUNDAY, EXPECT DELAYS NOON TO 4 PM" and "OZONE ALERT CODE RED—USE TRANSIT."

Guidance:

05 *When a CMS is used to display a safety or transportation related message, the message should be simple, brief, legible, and clear. A CMS should not be used to display a safety or transportation-related message if doing so would adversely affect respect for the sign. "CONGESTION AHEAD" or other overly simplistic or vague messages should not be displayed alone. These messages should be supplemented with a message on the location or distance to the congestion or incident, delay and travel time, alternative route, or other similar messages.*

Standard:

06 **When a CMS is used to display a safety, transportation-related, emergency homeland security, or AMBER alert message, the display format shall not be of a type that could be considered similar to advertising displays.**

Support:

07 Section 2B.13 contains information regarding the design of changeable message signs that are used to display variable speed limits that change based on ambient or operational conditions, or that display the speed at which approaching drivers are traveling.

Section 2L.03 Legibility and Visibility of Changeable Message Signs

Support:

01 The maximum distance at which a driver can first correctly identify letters and words on a sign is called the legibility distance of the sign. Legibility distance is affected by the characteristics of the sign design and the visual capabilities of drivers. Visual capabilities, and thus legibility distances, vary among drivers.

02 For the more common types of changeable message signs, the longest measured legibility distances on sunny days occur during mid-day when the sun is overhead. Legibility distances are much shorter when the sun is behind the sign face, when the sun is on the horizon and shining on the sign face, or at night.

03 Visibility is the characteristic that enables a CMS to be seen. Visibility is associated with the point where the CMS is first detected, whereas legibility is the point where the message on the CMS can be read.

Environmental conditions such as rain, fog, and snow impact the visibility of changeable message signs and can reduce the available legibility distances. During these conditions, there might not be enough viewing time for drivers to read the message.

Guidance:

04 *Changeable message signs used on roadways with speed limits of 55 mph or higher should be visible from 1/2 mile under both day and night conditions. The message should be designed to be legible from a minimum distance of 600 feet for nighttime conditions and 800 feet for normal daylight conditions. When environmental conditions that reduce visibility and legibility are present, or when the legibility distances stated in the previous sentences in this paragraph cannot be practically achieved, messages composed of fewer units of information should be used and consideration should be given to limiting the message to a single phase (see Section 2L.05 for information regarding the lengths of messages displayed on changeable message signs).*

Section 2L.04 Design Characteristics of Changeable Message Signs

Standard:

- 01 **Changeable message signs shall not include advertising, animation, rapid flashing, dissolving, exploding, scrolling, or other dynamic elements.**

Support:

- 02 Section 6F.61 contains information regarding the use of arrow boards that use flashing or sequential displays for lane closures.

Guidance:

- 03 *Except in the case of a limited-legend CMS (such as a blank-out or electronic-display changeable message regulatory sign) that is used in place of a static regulatory sign or an activated blank-out warning sign that supplements a static warning sign at a separate location, changeable message signs should be used as a supplement to and not as a substitute for conventional signs and markings.*
- 04 *CMS should be limited to no more than three lines, with no more than 20 characters per line.*
- 05 *The spacing between characters in a word should be between 25 to 40 percent of the letter height. The spacing between words in a message should be between 75 and 100 percent of the letter height. Spacing between the message lines should be between 50 and 75 percent of the letter height.*

06 *Except as provided in Paragraph 18, word messages on changeable message signs should be composed of all upper-case letters. The minimum letter height should be 18 inches for changeable message signs on roadways with speed limits of 45 mph or higher. The minimum letter height should be 12 inches for changeable message signs on roadways with speed limits of less than 45 mph.*

Support:

- 07 Using letter heights of more than 18 inches will not result in proportional increases in legibility distance.

Guidance:

08 *The width-to-height ratio of the sign characters should be between 0.7 and 1.0. The stroke width-to-height ratio should be 0.2.*

Support:

- 09 The width-to-height ratio is commonly accomplished using a minimum font matrix density of five pixels wide by seven pixels high.

Standard:

- 10 **Changeable message signs shall automatically adjust their brightness under varying light conditions to maintain legibility.**

Guidance:

11 *The luminance of changeable message signs should meet industry criteria for daytime and nighttime conditions. Luminance contrast should be between 8 and 12 for all conditions.*

12 *Contrast orientation of changeable message signs should always be positive, that is, with luminous characters on a dark or less luminous background.*

Support:

13 Legibility distances for negative-contrast changeable message signs are likely to be at least 25 percent shorter than those of positive-contrast messages. In addition, the increased light emitted by negative-contrast changeable message signs has not been shown to improve detection distances.

Standard:

- 14 **The colors used for the legends and backgrounds on changeable message signs shall be as provided in Table 2A-5.**

Guidance:

15 *If a black background is used, the color used for the legend on a changeable message sign should match the background color that would be used on a standard sign for that type of legend, such as white for regulatory, yellow for warning, orange for temporary traffic control, red for stop or yield, fluorescent pink for incident management, and fluorescent yellow-green for bicycle, pedestrian, and school warning.*

Standard:

16 **If a green background is used for a guide message on a CMS or if a blue background is used for a motorist services message on a CMS, the background color shall be provided by green or blue lighted pixels such that the entire CMS would be lighted, not just the white legend.**

Support:

- 17 Some CMS that employ newer technologies have the capability to display an exact duplicate of a standard sign or other sign legend using standard symbols, the Standard Alphabets and letter forms, route shields, and other typical sign legend elements with no apparent loss of resolution or recognition to the road user when compared with a static version of the same sign legend. Such signs are of the full-matrix type and can typically display full-color legends. Use of such technologies for new CMS is encouraged for greater legibility of their displays and enhanced recognition of the message as it pertains to regulatory, warning, or guidance information.

Guidance:

- 18 *If used, the CMS described in the preceding paragraph should not display symbols or route shields unless they can do so in the appropriate color combinations. For a single-phase message where the Standard Alphabets and other legend elements of standard designs are used, the lettering style, size, and line spacing should comply with the applicable provisions for the type of message displayed as provided elsewhere in this Manual. For two-phase messages, larger legend heights should be used as described previously in this Section because of the need for such messages to be legible at a greater distance. Regardless of the number of phases, the CMS should comply with the legibility and visibility provisions of Section 2L.03.*

December 2009

Sect. 2L.04

Section 2L.05 Message Length and Units of Information

Guidance:

- 01 *The maximum length of a message should be dictated by the number of units of information contained in the message, in addition to the size of the CMS. A unit of information, which is a single answer to a single question that a driver can use to make a decision, should not be more than four words.*

Support:

- 02 *In order to illustrate the concept of units of information, Table 2L-1 shows an example message that is comprised of four units of information.*

- 03 *The maximum allowable number of units of information in a CMS message is based on the principles described in this Section, the current highway operating speed, the legibility characteristics of the CMS, and the lighting conditions.*

Standard:

- 04 **Each message shall consist of no more than two phases. A phase shall consist of no more than three lines of text. Each phase shall be understood by itself regardless of the sequence in which it is read. Messages shall be centered within each line of legend. Except for signs located on toll plaza structures or other facilities with a similar booth-lane arrangement, if more than one CMS is visible to road users, then only one sign shall display a sequential message at any given time.**

- 05 **Techniques of message display such as fading, rapid flashing, exploding, dissolving, or moving messages shall not be used. The text of the message shall not scroll or travel horizontally or vertically across the face of the sign.**

Guidance:

- 06 *When designing and displaying messages on changeable message signs, the following principles relative to message design should be used:*

- A. *The minimum time that an individual phase is displayed should be based on 1 second per word or 2 seconds per unit of information, whichever produces a lesser value. The display time for a phase should never be less than 2 seconds.*
- B. *The maximum cycle time of a two-phase message should be 8 seconds.*
- C. *The duration between the display of two phases should not exceed 0.3 seconds.*
- D. *No more than three units of information should be displayed on a phase of a message.*
- E. *No more than four units of information should be in a message when the traffic operating speeds are 35 mph or more.*
- F. *No more than five units of information should be in a message when the traffic operating speeds are less than 35 mph.*
- G. *Only one unit of information should appear on each line of the CMS.*

H. Compatible units of information should be displayed on the same message phase.

Table 2L-1. Example of Units of Information

Question	Answer	Number of Information Units
What happened?	MAJOR CRASH	1
Where?	AT EXIT 12	1
Who is the advisory for?	Drivers Heading TO NEW YORK	1
What is advised?	USE ROUTE 46	1

Note: The following is an example of a two-phase message that could be developed from the four information units shown in this table:

Sect. 2L.05
December 2009

Option:

07 A unit of information consisting of more than one word may be displayed on more than one line. An additional changeable message sign at a downstream location may be used for the purpose of allowing the entire message to be read twice.

Guidance:

08 *If more than two phases would be needed to display the necessary information, additional changeable message signs should be used to display this information as a series of two distinct, independent messages with a maximum of two phases at each location, in accordance with the provisions of Paragraph 4.*

09 *When the message on a CMS includes an abbreviation, the provisions of Section 1A.15 should be used.*

Section 2L.06 Installation of Permanent Changeable Message Signs**Guidance:**

01 *A CMS that is used in place of a static sign (such as a blank-out or variable legend regulatory sign) should be located in accordance with the provisions of Chapter 2A. The following factors should be considered when installing other permanent changeable message signs:*

- A. Changeable message signs should be located sufficiently upstream of known bottlenecks and high crash locations to enable road users to select an alternate route or take other appropriate action in response to a recurring condition.*
- B. Changeable message signs should be located sufficiently upstream of major diversion decision points, such as interchanges, to provide adequate distance over which road users can change lanes to reach one destination or the other.*
- C. Changeable message signs should not be located within an interchange except for toll plazas or managed lanes.*
- D. Changeable message signs should not be positioned at locations where the information load on drivers is already high because of guide signs and other types of information.*
- E. Changeable message signs should not be located in areas where drivers frequently perform lane-changing maneuvers in response to static guide sign information, or because of merging or weaving conditions.*

Support:

02 Information regarding the design and application of portable changeable message signs in temporary traffic control zones is contained in Section 6F.60.

Section 6F.60 Portable Changeable Message Signs

Support:

01 Portable changeable message signs (PCMS) are TTC devices installed for temporary use with the flexibility to display a variety of messages. In most cases, portable changeable message signs follow the same provisions for design and application as those given for changeable message signs in Chapter 2L. The information in this Section describes situations where the provisions for portable changeable message signs differ from those given in Chapter 2L.

Sect. 6F.57 to 6F.60 December 2009

2009 Edition Page 599

02 Portable changeable message signs are used most frequently on high-density urban freeways, but have applications on all types of highways where highway alignment, road user routing problems, or other pertinent conditions require advance warning and information.

03 Portable changeable message signs have a wide variety of applications in TTC zones including: roadway, lane, or ramp closures; incident management; width restriction information; speed control or reductions; advisories on work scheduling; road user management and diversion; warning of adverse conditions or special events; and other operational control.

04 The primary purpose of portable changeable message signs in TTC zones is to advise the road user of unexpected situations. Portable changeable message signs are particularly useful as they are capable of:

- A. Conveying complex messages,
- B. Displaying real time information about conditions ahead, and
- C. Providing information to assist road users in making decisions prior to the point where actions must be taken.

05 Some typical applications include the following:

- A. Where the speed of vehicular traffic is expected to drop substantially;
- B. Where significant queuing and delays are expected;
- C. Where adverse environmental conditions are present;
- D. Where there are changes in alignment or surface conditions;
- E. Where advance notice of ramp, lane, or roadway closures is needed;
- F. Where crash or incident management is needed; and/or
- G. Where changes in the road user pattern occur.

Guidance:

06 *The components of a portable changeable message sign should include: a message sign, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material.*

Standard:

07 **Portable changeable message signs shall comply with the applicable design and application principles established in Chapter 2A. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.**

Support:

08 Section 2L.02 contains information regarding overly simplistic or vague messages that is also applicable to portable changeable message signs.

Standard:

09 **The colors used for legends on portable changeable message signs shall comply with those shown in Table 2A-5.**

Support:

10 Section 2L.04 contains information regarding the luminance, luminance contrast, and contrast orientation that is also applicable to portable changeable message signs.

Guidance:

11 *Portable changeable message signs should be visible from 1/2 mile under both day and night conditions.*

Support:

12 Section 2B.13 contains information regarding the design of portable changeable message signs that are used to display speed limits that change based on operational conditions, or are used to display the speed at which approaching drivers are traveling.

Guidance:

13 *A portable changeable message sign should be limited to three lines of eight characters per line or should consist of a full matrix display.*

14 *Except as provided in Paragraph 15, the letter height used for portable changeable message sign messages should be a minimum of 18 inches.*

Option:

15 For portable changeable message signs mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a portable changeable message sign used on low speed facilities provided that the message is legible from at least 650 feet.

16 The portable changeable message sign may vary in size.

December 2009 Sect. 6F.60

Page 600 2009 Edition

Guidance:

17 *Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one portable changeable message sign is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.*

Support:

18 Road users have difficulties in reading messages displayed in more than two phases on a typical three-line portable changeable message sign.

Standard:

19 **Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, travelling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.**

Guidance:

20 *When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases should be a maximum of 8 seconds.*

21 *All messages should be designed with consideration given to the principles provided in this Section and also taking into account the following:*

A. The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:

- 1. The problem or situation that the road user will encounter ahead,*
- 2. The location of or distance to the problem or situation, and*
- 3. The recommended driver action.*

B. If more than two phases are needed to display a message, additional portable changeable message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of highways.

Standard:

22 **When the word messages shown in Tables 1A-1 or 1A-2 need to be abbreviated on a portable changeable message sign, the provisions described in Section 1A.15 shall be followed.**

23 **In order to maintain legibility, portable changeable message signs shall automatically adjust their brightness under varying light conditions.**

24 **The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.**

25 **Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.**

26 **The mounting of portable changeable message signs on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway in urban areas and 5 feet above the roadway in rural areas when it is in the operating mode.**

Guidance:

27 *Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.*

28 *When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.*

29 *Portable changeable message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign message.*

30 *Portable changeable message signs should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where a traffic barrier is not available to shield the portable changeable message sign, it should be placed off the shoulder and outside of the clear zone. If a portable changeable message sign has to be placed on the shoulder of the roadway or within the clear zone, it should be delineated with retroreflective TTC devices.*

31 *When portable changeable message signs are used in TTC zones, they should display only TTC messages.*

Sect. 6F.60 December 2009

2009 Edition Page 601

32 *When portable changeable message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is not practical, they should be delineated with retroreflective TTC devices.*

33 *Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.*

Table 2A-5. Common Uses of Sign Colors

Type of Sign	Legend								Background											Pink
	Black	Green	Red	White	Yellow	Orange	Fluorescent Yellow-Green	Fluorescent Pink	Black	Blue	Brown	Green	Orange*	Red*	White	Yellow*	Purple	Fluorescent	Yellow-Green	
Regulatory	X		X	X					X					X	X					
Prohibitive			X	X										X	X					
Permissive		X													X					
Warning	X															X				
Pedestrian	X															X		X		
Bicycle	X															X		X		
Guide				X								X								
Interstate Route				X						X				X						
State Route	X														X					
U.S. Route	X														X					
County Route					X					X										
Forest Route				X							X									
Street Name				X								X								
Destination				X								X								
Reference Location				X								X								
Information				X						X		X								
Evacuation Route				X						X										
Road User Service				X						X										
Recreational				X							X	X								
Temporary Traffic Control	X												X							
Incident Management	X												X						X	
School	X																	X		
ETC-Account Only	X																X****			
Changeable Message Signs																				
Regulatory			X***	X					X											
Warning					X				X											
Temporary Traffic Control					X	X			X											
Guide				X					X			X**								
Motorist Services				X					X	X**										
Incident Management					X			X	X											
School, Pedestrian, Bicycle					X		X		X											

* Fluorescent versions of these background colors may also be used.

** These alternative background colors would be provided by blue or green lighted pixels such that the entire CMS would be lighted, not just the legend.

*** Red is used only for the circle and slash or other red elements of a similar static regulatory sign.

**** The use of the color purple on signs is restricted per the provisions of Paragraph 1 of Section 2F03.